



US006246893B1

(12) **United States Patent**
Gobeli

(10) Patent No.: **US 6,246,893 B1**
(45) Date of Patent: **Jun. 12, 2001**

(54) **METHOD AND DEVICE FOR GLUCOSE CONCENTRATION MEASUREMENT WITH SPECIAL ATTENTION TO BLOOD GLUCOSE DETERMINATIONS**

(75) Inventor: **Garth W. Gobeli, Albuquerque, NM (US)**

(73) Assignee: **TecMed Incorporated, Albuquerque, NM (US)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/873,999**

(22) Filed: **Jun. 12, 1997**

(Under 37 CFR 1.47)

(51) Int. Cl.⁷ **A61B 5/00**

(52) U.S. Cl. **600/318; 600/319; 600/336**

(58) Field of Search **600/310, 316, 600/318-320, 322, 323, 336; 356/39-41**

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,958,560	5/1976	March	128/2
4,014,321	3/1977	March	128/2
4,721,677	1/1988	Clark, Jr.	435/291
5,006,342	4/1991	Cleary et al.	424/445
5,009,230	4/1991	Hutchinson	128/633
5,070,874	12/1991	Barnes et al.	128/633
5,139,023	8/1992	Stanley et al.	128/637
5,140,985	8/1992	Schroeder et al.	128/632
5,209,231 *	5/1993	Cote et al.	
5,313,941	5/1994	Braig et al.	128/633
5,321,265	6/1994	Block	250/343
5,370,114	12/1994	Wong et al.	128/633
5,379,764	1/1995	Barnes et al.	128/633
5,383,452 *	1/1995	Buchert	
5,398,681	3/1995	Kuperschmidt	128/633

5,433,197	7/1995	Stark	128/633
5,435,309	7/1995	Thomas et al.	128/633
5,448,992	9/1995	Kuperschmidt	128/633
5,568,049	10/1996	Bucholtz	324/244.1
5,687,721 *	11/1997	Kuhls	
5,788,632 *	8/1998	Pezzaniti et al.	600/316

OTHER PUBLICATIONS

Hecht, E, "Optics, Second Edition," Addison-Wesley Publishing, pp. 316-321, 1987.*

"Microdegree Polarimetry Using A Diode Laser For Glucose Detection", by Marcel J. Gocitz Jr., Martin D. Fox and Robert B. Northrop, IEEE 1992, pp. 97-98.

"Noninvasive Glucose Monitoring of the Aqueous Humor of the Eye: Part I. Measurement of Very Small Optical Rotations", by B. Rabinovitch, W. F. March and Robert L. Adams, Diabetes Care, vol. 5, No. 3, May-Jun. 1982, pp. 254-258.

(List continued on next page.)

Primary Examiner—Lee Cohen

Assistant Examiner—David M. Ruddy

(74) Attorney, Agent, or Firm—Cahill, Sutton & Thomas P.L.C.

(57) **ABSTRACT**

The concentration of glucose in the anterior chamber of an eye is non-invasively measured by guiding a beam through a polarizer (4), a quarter wave plate (6), a polarization modulator (20), and an analyzer (7). After initializing the polarizer and the analyzer to extinguish the beam, it is guided parallel to the iris (56) of the eye (50) and introduced into the anterior chamber (57), wherein it is refracted, impinges on and is reflected from the iris, and exits the anterior chamber approximately collinear with the portion (55A) of the beam incident on the anterior chamber. The beam then is guided onto a detector (10), and a sufficient signal is applied to the polarization modulator to extinguish the beam. The signal represents the glucose concentration in the patient's blood.

41 Claims, 9 Drawing Sheets

